

# **APPENDIX A**

## **MARYLAND DEPARTMENT OF PLANNING LAND USE/LAND COVER DESCRIPTIONS**



**1990 & 1994 MdOP Land Use/Land Cover**  
**(Use and document more recent codes if available)**

Organization: by County

Source: Maryland Office of Planning

Projection: Stateplane NAD 83

Units: Meters

Spatial Data Type: Polygon

**10 Urban Built-up**

- **11 Low Density Residential** – Detached single family/duplex dwelling units, yards, and associated areas. Areas of more than 90 percent single family/duplex dwelling units, with lot sizes less than five acres but at least one-half acres (.2 dwelling units/acre to 2 dwelling units/acre).
- **12 Medium Density Residential** – Detached single family/duplex, attached single unit row housing, yards, and associated areas. Areas of more than 90 percent single family/duplex units and attached single unit row housing, with lot sizes of less than one-half acre but at least one-eighth acre (2 dwelling units/acre to 8 dwelling units/acre).
- **13 High Density Residential** – Attached single unit row housing, garden apartments, high rise apartments/condominiums, mobile home and trailer parks. Areas of more than 90 percent high density residential units, with more than 8 dwelling units/acre.
- **14 Commercial** – Retail and wholesale services. Areas used primarily for the sale of products and services, including associated yards and parking areas.
- **15 Industrial** – Manufacturing and industrial parks, including associated warehouses, storage yards, research laboratories, and parking areas.
- **16 Institutional** – Elementary and secondary schools, middle schools, junior and senior high schools, public and private colleges and universities, military installations (built-up areas only, including buildings and storage, training, and similar areas) churches and health facilities, correctional facilities, and government offices and facilities that are clearly separable from the surrounding land cover.
- **17 Extractive** – Surface mining operations, including sand and gravel pits, quarries, coal surface mines, and deep coal mines. Status of activity (active vs. abandoned) is not distinguished.
- **18 Open Urban Land** – Urban areas whose use does not require structures, or urban areas where non-conforming uses characterized by open land have become isolated. Included are golf courses, parks, recreation areas (except associated with schools or other institutions), cemeteries, and entrapped agricultural and undeveloped land within urban areas.
- **191 Large Lot Subdivision (Agriculture)** – Residential subdivisions with lot sizes less than 20 acres but at least 5 acres, with a dominant land cover of open fields or pasture.
- **192 Large Lot Subdivision (Forest)** – Residential subdivisions with lot sizes less than 20 acres but at least 5 acres, with a dominant land cover of deciduous, evergreen or mixed forest.

## **20 Agriculture**

- **21 Cropland** – Field and forage crops.
- **22 Pasture** – Land used for pasture, both permanent and rotated: grass.
- **23 Orchards/Vineyards/Horticulture** – Areas of intensively managed commercial bush and tree crops, including areas used for fruit production, vineyards, sod and seed farms, nurseries, and green houses.
- **24 Feeding Operations** – Cattle or hog feeding lots, poultry houses, and holding lots for animals, and commercial fishing areas (including oyster beds).
- **241 Feeding Operations** – Cattle or hog feeding lots, poultry houses, and holding lots for animals.
- **242 Agricultural Building** – Breeding and training facilities, storage facilities, built-up areas associated with a farmstead, small farm ponds, and commercial fishing areas.
- **25 Row and Garden Crops** – Intensively managed track and vegetable farms and associated areas.

## **40 Forest**

- **41 Deciduous Forest** – Forested areas in which the trees characteristically lose their leaves at the end of the growing season. Included are such species as oak, hickory, aspen, sycamore, birch, yellow poplar, elm, maple, and cypress.
- **42 Evergreen Forest** - Forested areas in which the trees are characterized by persistent foliage throughout the year. Included are such species as white pine, pond pine, hemlock, southern white cedar, and red pine.
- **43 Mixed Forest** – Forested areas in which neither deciduous or evergreen species dominate, but in which there is a combination of both types.
- **44 Brush** – Areas that do not produce timber or other wood products but may have cut-over timber stands, abandoned agriculture fields, or pasture. These areas are characterized by vegetation types such as sumac, vines, rose, brambles, and tree seedlings.

**50 Water** – Rivers, waterways, reservoirs, ponds, bays, estuaries, and ocean.

**60 Wetlands** – Forested and non-forested wetlands, including tidal flats, tidal and non-tidal marshes, and upland swamps and wet areas.

## **70 Barren Land**

- **71 Beaches** – Extensive shoreline areas of sand and gravel accumulation, with no vegetative cover or other land use.
- **72 Bare Exposed Rock** – Areas of bedrock exposure, scarps, and other natural accumulations of rock without vegetative cover.

- **73 Bare Ground** – Areas of exposed ground caused naturally, by construction, or other cultural processes.

# **APPENDIX B**

## **REVISING SUBWATERSHED MANAGEMENT CLASSIFICATION POINT SYSTEM**



**Table A1. Rurally Impacted Subwatersheds Point System<sup>1</sup>**

Subwatershed Name	Subwatershed ID	Cropland	Pasture	Unforested Streamside	Livestock Access	Eroded Banks	Nitrate	Fish IBI	Benthic IBI	Physical Habitat Index	Total Points	Total Possible Points	Score
Little East Bynum	BC-6	1			1	1	1	NA	NA	NA	4	6	67
Grays Run	CC-2				NA	NA		NA	1		1	6	14
James Run	BC-5		1	1	NA	NA			1		3	7	43
East Branch	OP-7								1		1	9	22
West Branch	OP-6	1	1	1			1	1			5	9	56
Mountain Branch	OP-3					1		NA		NA	1	7	14
Upper Winters DD	OP-5								1		1	9	11

Notes:

All subwatersheds have impervious cover under 10%

IBI: Index of Biological Integrity

NA: data not available

1: For additional information on the point system, see Section 2.4

**Table A2. Impacted Special Resource Subwatersheds Point System<sup>1</sup>**

Subwatershed Name	Subwatershed ID	Tidal	FIDS Habitat	NWI	WSC	Forested Stream-side	Critical Area	Fish IBI	Benthic IBI	Physical Habitat Index	Change in IC% <sup>2</sup>	Total Points	Total Possible Points	Score
Middle Winters DD	OP-4							NA	NA	NA		0	7	0
Bear Cabin	OP-8							NA		1		1	9	11
Church Creek DD	CC-1	1			1	1	1	NA	NA	NA	1	5	7	71
Lower Bynum	BC-2							1		1		2	10	20
Cranberry Run	CC-3		1	1		1	1			1		5	10	50
Bush Creek DD	BC-1	1		1	1		1	NA	NA	NA	1	5	7	71
Haha Branch	OP-10	1	1	1		1		NA			1	5	9	56
Otter Point DD	OP-1	1	1	1	1		1	NA	NA	NA		5	7	71
Middle Bynum	BC-3							1		1		2	10	20
Lower Winters DD	OP-2		1					1		1		3	10	30
Upper Bynum	BC-4											0	10	0
Plumtree Run	OP-9											0	10	0

Notes:

All subwatersheds have current impervious cover between 10 and 25%

FIDS: Forest Interior Dwelling Species habitat

NWI: National Wetlands Inventory

WSC: Wetlands of Special Concern

IBI: Index of Biological Integrity

NA: data not available

1: For additional information on the point system, see Section 2.4

2: Difference between %Current IC and %Future IC





# **APPENDIX C**

## **SUMMARY DATA AND FIELD FORMS: RBP, CONTIGUOUS FOREST ASSESSMENT, AND WETLAND EVALUATION**



# RBP HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME		LOCATION	
STATION # _____ RIVER		STREAM CLASS	
LAT _____ LONG		RIVER BASIN	
STORET #		AGENCY	
INVESTIGATORS			
FORM COMPLETED BY		DATE _____ TIME _____ AM PM	REASON FOR SURVEY

	Optimal	Suboptimal	Marginal	Poor
<b>1. Epifaunal Substrate/ Available Cover</b>	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat ; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>2. Embeddedness</b>	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>3. Velocity/Depth Regime</b>	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

# RBP HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

	Optimal	Suboptimal	Marginal	Poor
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Frequency of Riffles (or bends)</b>	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
Note: determine left or right side by facing downstream.				
SCORE ____ (LB)	Left Bank 10	8 7 6	5 4 3	2 1 0
SCORE ____ (RB)	Right Bank 10	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ____ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ____ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE ____ (LB)	Left Bank 10	8 7 6	5 4 3	2 1 0
SCORE ____ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score \_\_\_\_\_

RBP Habitat Assessment Data Summary																	
Subwatershed Name	Subwatershed ID	RBP Station #	Epifaunal Substrate	Embeddedness	Velocity/Depth Regime	Sediment Deposition	Channel Flow Status	Channel Alteration	Channel Sinuosity	Bank Stability Left	Bank Stability Right	Veg. Protect Left	Veg. Protect Right	Riparian Zone Left	Riparian Zone Right	Total Score	Habitat Category
James Run	BC5	1	16	16	16	16	15	16	17	8	8	8	8	6	6	156	Good
James Run	BC5	2	15	14	15	16	15	16	17	5	8	5	8	1	9	144	Good
Little East Bynum	BC6	1	15	12	14	13	16	16	17	6	8	7	7	4	9	144	Good
Little East Bynum	BC6	2	13	12	14	11	15	6	13	7	7	7	7	1	1	114	Poor
Little East Bynum	BC6	3	15	13	14	13	16	16	17	8	8	8	8	9	7	152	Good
Grays Run	CC2	1	17	19	18	19	18	18	17	9	9	9	9	9	9	180	Excellent
Grays Run	CC2	2	18	19	17	19	18	19	19	9	9	9	9	9	10	184	Excellent
Grays Run	CC2	3	17	14	13	15	19	17	12	7	6	7	7	8	8	150	Good
Otter Point DD	OP1	1	2	2	6	2	2	16	16	0	0	1	1	6	5	59	Poor
Otter Point DD	OP1	3	4	3	5	4	8	16	16	2	2	2	2	8	8	80	Poor
Middle Winters	OP4	1	13	11	14	13	13	16	16	5	4	7	6	4	4	126	Fair
Middle Winters	OP4	2	15	13	17	14	15	16	17	5	5	5	5	6	8	141	Fair
Middle Winters	OP4	3	17	17	15	18	18	17	18	8	8	7	7	5	5	160	Good
East Branch	OP7	1	16	17	17	17	17	16	16	7	7	6	6	6	2	150	Good
East Branch	OP7	2	14	14	16	10	16	16	16	7	6	7	6	9	8	145	Good
Bear Cabin	OP8	1	18	15	18	17	17	17	18	9	9	9	9	5	8	169	Excellent
Bear Cabin	OP8	2	6	13	13	4	8	17	16	4	4	5	5	6	6	107	Poor
Bear Cabin	OP8	3	14	11	16	16	18	18	18	7	8	8	8	7	7	156	Good
Ha Ha	OP10	1	3	6	6	5	8	16	5	3	3	3	3	9	9	79	Poor
Ha Ha	OP10	2	5	6	6	5	8	16	15	3	3	3	3	8	8	89	Poor



**CONSERVATION AREA PLANNING  
UPLAND CONTIGUOUS FOREST  
FIELD DATA SHEET**

<b>PROJECT:</b>	<b>LOCATION</b>
<b>STATION #</b> _____	<b>STORET #</b>
<b>LAT</b> _____ <b>LONG</b>	<b>INVESTIGATORS</b>
<b>FORM COMPLETED BY</b>	<b>Picture #</b>
<b>DATE</b> _____	<b>Weather</b>
<b>TIME</b> _____ <b>AM</b> <b>PM</b>	

<b>FOREST ASSOCIATION</b>	Loblolly Pine, Willow Oak -- Loblolly Pine, Bald Cypress, Basket Oak – Loblolly Pine , Chestnut- Post - Black Jack Oak., Other - describe		
<b># OF TREES IN PRISM and DBH</b>			
<b>DOMINANT TREE SPECIES</b>			
<b>SPECIMEN OR RARE SPECIES</b>	Rank (1-5) 5 being highest Describe		
<b>DENSIOMETER READING # of spaces &gt;3/4 filled</b>	/24		
<b>WETLAND?</b>	Soils	Hydrology	Plants
<b>UNDERSTORY CHARACTERIZATION</b>	Dense, Medium, Sparse                      Dominant species		
<b>HABITAT COMPLEXITY</b>	Canopy, Mid Canopy, Understory 3 present   2 present   1 present		
<b>FORBES</b>	Dense, Medium, Sparse		
<b>EVIDENCE OF DISRUPTION AND EXTENT (%)</b>	Natural ( ie. storm)	Anthropogenic (ie. clearing, dirt road, timber harvesting )	Disease
<b>INVASIVES</b>			
<b>WATERSHED FEATURES</b>	<b>Predominant Surrounding Landuse</b> ' Forest ' Commercial ' Field/Pasture ' Industrial ' Agricultural ' Residential ' Other _____	<b>Local Watershed NPS Pollution</b> ' No evidence ' Some potential sources ' Obvious sources	

**Notes or Sketch on Back**



**CONSERVATION AREA PLANNING  
UPLAND CONTIGUOUS FOREST  
FIELD DATA SHEET (CONT.)**

## Contiguous Forest Evaluation Data Summary

Station ID	Subwatershed	# of trees in prism	Median DBH	Dominant Tree Species	Avg Densiometer Reading	Understory/ species	Habitat Complexity	Forbes	Disruption	Invasives	Predominant surrounding land use	Local NPS Pollution
CA-OP1-1	Otter Point DD	12	14.5	green ash	22.5	medium	3	med	beaver	N	forest, res.	no evidence
CA-CC2-1	Grays Run	10	16	beech	21.8	medium; beech	3	sparse	farm; cattle; ATV	N	forest, field, ag, res.	some (ATV, cattle)
CA-CC2-2	Grays Run	12	9	tulip poplar, red maple	15.8	sparse; beech, poplar,	2	sparse	limited clearing, dirt road	N	forest	none
CA-CC2-3	Grays Run	9	7.5	beech, tulip	19.0	dense; sassafras, beech, poplar, multi-flora	3 (thin; older, selective cutting)	sparse	timber harvesting (a couple years ago 5-10)	N	forest	no evidence
CA-CC2-4	Grays Run	14	14.5	beech, tulip	22.3	medium; beech	3	sparse	minor selective cutting	N	forest	no evidence
CA-CC2-5	Grays Run	13	15		21.3	medium; beech	3	n/a	no evidence	N	forest	some potential sources



Wildlife Wetland Assessment Data Summary																	
Station ID#	Subwatershed	Element															FCI
		4	16	20	11a	11b	11c	12a	12b	12c	12d	13a	13b	21a	22a	23	
WT-BC1-1	Bush Creek DD	1.00	1.00	1.00	1.00	0.30	1.00	0.26	0.10	0.10	1.00	0.10	0.10	0.10	0.00	0.10	0.66
WT-CC2-1	Church Creek DD	1.00	1.00	1.00	0.50	0.30		0.19	0.10	0.10	1.00	1.00	0.50	0.10	0.00	0.10	0.68
Element #s align with Wildlife Data Sheet FC: Functional Condition Index (0-1)																	

Water Quality Wetland Assessment Data Summary																						
Station ID#	Subwatershed	Element																				FCI
		15	4b	7a	16	1	5	14	10	10h	10l	9	17	18	19	LF	SS	V	WC	W	C	
WT-BC1-1	Bush Creek DD	1.00	1.00	1.00	1.00	0.70	1.00	1.00	1.00	1.00	1.00	1.00		0.50	1.00	1.00	0.90	1.00	0.70	0.95	0.98	0.92
WT-CC2-1	Church Creek DD	1.00	1.00	1.00	1.00	0.70	1.00	1.00	1.00	1.00	1.00	1.00		0.70	1.00	1.00	0.90	1.00	0.74	0.95	0.98	0.93
Element #s align with Water Quality Data Sheet LF: Limiting Factors SS: Substrate Slope V: Vegetation Characteristics WC: Water Contact W: Wetland Characteristics C: Wetland Condition FC: Functional Condition Index (0-1)																						



# **APPENDIX D**

## **THE WATERSHED RETROFITTING PROCESS**



Ideally, stormwater treatment practices, designed to maintain water quality, control flooding, protect stream channels, or meet other watershed goals, are put in place as development occurs. When sites are designed in this way, with stormwater management in mind, the necessary contours, space, and other features to accommodate these practices are provided. The State of Maryland stormwater regulations require new development and redevelopment to carefully consider stormwater management and develop appropriate and effective designs to manage stormwater runoff from sites. Unfortunately, there are substantial portions of the Bush River watershed developed prior to these requirements. In these areas, there are generally either no stormwater treatment practices or practices that only provide peak discharge controls for larger storm events (e.g., the 2 or 10 year return frequency storms). Peak discharge facilities have little capability to control channel erosion or enhance water quality.

Watershed retrofitting should be viewed as a long-term process involving a myriad of disciplines from natural resources management, to engineering design, to public policy and education. Since every watershed is different, it is a challenge to break such a complicated process into a step-wise, objective approach. However, there are eight basic elements that are key to a successful retrofitting effort. Over the past several years, CWP staff has developed a step-by-step approach to stormwater retrofitting (CWP, 2000). Table 1 presents this approach. This Bush River study is limited to the first three steps of the process presented in Table 1.

**Table 1            Basic Elements of a Stormwater Retrofitting Implementation Strategy**

<b>Step</b>	<b>Element</b>	<b>Purpose</b>
1.	Preliminary Watershed Retrofit Inventory	Identify potential retrofit sites
2.	Field Assessment of Potential Retrofit Sites	Verify that sites are feasible and appropriate, produce concept designs.
3.	Prioritize Sites for Implementation	Set up a priority for implementing future sites
4.	Public Involvement Process	Solicit comments and input from the public and adjacent residents on potential sites
5.	Retrofit Design	Prepare construction drawings for specific facilities
6.	Permitting	Obtain the necessary approvals and permits for specific facilities
7.	Construction Inspections	Ensure that facilities are constructed properly in accordance with the design plans
8.	Maintenance Plan	Ensure that facilities are adequately maintained

Retrofits come in many shapes and sizes, from large regional retention ponds that provide a variety of controls, to small on-site facilities providing only water quality treatment for smaller storms. Usually, at least some kind of practice can be installed in almost any situation. However, fiscal constraints, pollutant removal capability, practical physical limitations and watershed capture area must all be carefully weighed in any retrofit selection criteria. These factors will often result in eliminating a potential site from further consideration.



The first step in retrofit implementation strategy is the process of identifying feasible and appropriate retrofit site locations. This involves a process of identifying as many potential sites as possible. The best retrofit sites fit easily into the existing landscape, are located at or near major drainage outlets or existing stormwater control facilities, and are easily accessible. In other areas, there are large stormwater outfalls where suitable retrofit opportunities exist. Table 2 lists some of the most likely spots for locating facilities and some common applications.

**Table 2            Best locations for Stormwater Retrofits**

<b>Location</b>	<b>Type of Retrofit</b>
Existing stormwater detention facilities.	Usually retrofitted as a wet pond or stormwater wetland capable of multiple storm frequency management
Immediately upstream of existing road culverts	Often a wet pond, wetland, or extended detention facility capable of multiple storm frequency management
Immediately below or adjacent to existing storm drain outfalls	Usually water quality only practices, such as sand filters, vegetative filters or other small storm treatment facilities
Directly within urban drainage and flood control channels	Usually small scale weirs or other flow attenuation devices to facilitate settling of solids within open channels
Highway rights-of-way and cloverleaves	Can be a variety of practices, but usually ponds or wetlands
Within large open spaces, such as golf courses and parks.	Can be a variety of practices, but usually ponds or wetlands capable of multiple storm frequency management
Within or adjacent to large parking lots	Usually water quality only facilities such as sand filters or other organic media filters (e.g., bioretention)

Step 1 of the retrofit process is completed in the office using topographic mapping, low altitude aerial photographs, and land use, zoning, and property maps. Storm drain master plans are also useful during the inventory process. Scouting for potential candidate sites follows the guidance discussed above in Table 2.

Two important tasks need to be undertaken before venturing into the field. First, the drainage area to each retrofit is delineated and second, the potential surface area of the facility is measured. The drainage area is used along with an estimate of impervious cover within the drainage area to calculate the target water quality and channel protection volumes. The potential surface area is used to compute a preliminary storage volume for the facility. A preliminary storage volume (V) for a pond can be computed by multiplying two-thirds of the facility surface area (SA) times an estimated maximum depth (d) ( $V = 0.67 \times SA \times d$ ). These two pieces of information are used as a quick screening tool.

For this study, the water quality target storage volume for each retrofit is equal to approximately 1 inch per impervious acre<sup>1</sup>. Providing channel protection storage was also a priority of the retrofit inventory and concept development, because the stream corridor assessment method (SCAM) survey data indicated the presence of significant channel erosion areas throughout the subwatersheds.

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<sup>1</sup> The justification for targeting 1 inch per impervious acre is based on the new State of Maryland water quality design rainfall, which was derived from a rainfall frequency analysis approach that attempts to capture and treat approximately 90% of the annual events. This sizing criteria: (1) captures 90% of the annual runoff load, providing water quality treatment for all but the larger storms; even the larger storms will receive some degree of treatment; (2) captures and treats more than just the so called, “first flush”; and (3) ensures fairly high level of treatment at highly impervious sites that are often hotspot areas such as parking lots, gas stations, and convenience stores.

Channel protection target storage volume was determined by providing 24-hour extended detention for the 1-year return frequency storm, which for Harford County is approximately 2.6 inches<sup>2</sup>.

In the next step, Step 2, the candidate retrofit sites are investigated in the field to verify that they are feasible. Without detailed infrastructure mapping, the field investigation is more complicated and requires some investigation at each candidate site to determine the location of outfalls and the general storm drain network configuration. The storm drain network is particularly important for refining tributary drainage areas. The field investigation also involves a careful assessment of site-specific information such as identifying the presence of sensitive environmental features, the location of existing utilities, the type of adjacent land uses, the condition of receiving waters, construction and maintenance access opportunities, and most importantly, whether or not the contemplated retrofit will actually work in the specified location. A conceptual sketch is prepared, photographs are taken, and the retrofit inventory form is completed for each site (see Appendix E).

## **References**

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Center for Watershed Protection. 2000. *The Practice of Watershed Protection*. pp. 742.

Morisawa, M. and LaFlure, 1979. Hydraulic Geometry, Stream Equilibrium and Urbanization, In *Adjustments of the Fluvial System*, D.D. Rhodes and G.P. Williams (eds.), *Proc. 10<sup>th</sup> Annual Geomorphology Symposium. Series*, Binghamton, N.Y. (Sept. 21-22), pp.333-350.

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<sup>2</sup> Channel protection in stormwater management attempts to minimize the downstream channel expansion and erosion, which normally occurs with urbanization of a watershed. As pervious surfaces such as fields and forests are converted to impervious surfaces, the volume and frequency of runoff is increased significantly. Researchers have demonstrated that urbanization causes channels to expand two to five times their original size to adjust to the increased volume and frequency of runoff from impervious surfaces and the increased routing efficiency of curbs, gutters and storm drains (Moriwasa and LaFlure, 1979, and Allen and Narramore, 1985). Typically, the "channel forming" events have a recurrence interval of between 1 and 2 years, with approximately 1.5 years as the most prevalent. The premise of the 1-yr, 24-hr extended detention design criteria is that runoff is stored and released in such a gradual manner that critical erosive velocities are seldom exceeded in downstream channels.



# **APPENDIX E**

## **RETROFIT INVENTORY FIELD SHEETS AND PHOTOGRAPHS**



**Stormwater retrofit: HH-1**





**Stormwater retrofit: HH-2**



**Stormwater retrofit: HH-4**





**Stormwater retrofit: HH-5**



**Stormwater retrofit: OP-1**





**Stormwater retrofit:OP-2**



**Stormwater retrofit: OP-3**



**Stormwater retrofit: OP-4**





**Stormwater retrofit: OP-6**



**Stormwater retrofit: OP-8**





**Stormwater retrofit: OP-9**





**Stormwater retrofit: OP-10**





**Stormwater retrofit: OP-11**



**Stormwater retrofit: OP-12**





**Stormwater retrofit: OP-13**



**Stormwater retrofit: OP-14**



# **APPENDIX F**

## **PRIORITY SUBWATERSHED POINT SYSTEM**



**Table D1. Priority Sensitive Subwatersheds Point System<sup>1</sup>**

Subwatershed Name	Subwatershed ID	FIDS Habitat	WSC	Forested Streamside	Critical Area	Fish IBI	Benthic IBI	Physical Habitat Index	Change in IC%*	Total Points	Total Possible Points	Score
Grays Run	CC-2	1		1	1	NA		1	1	5	7	71
James Run	BC-5					1		1	1	3	8	38
East Branch	OP-7	1				1		1		3	8	38
Mountain Branch	OP-3					NA		NA		0	6	0
Upper Winters DD	OP-5					1				1	8	13
Notes: All subwatersheds have impervious cover under 10% Difference between % Current IC and % Future IC FIDS: Forest Interior Dwelling Species habitat IBI: Index of Biological Integrity NA: data not available 1: For additional details on the point system, see Section 2.7												

**Table D2. Priority Impacted Subwatersheds Point System**

Subwatershed Name	Subwatershed ID	Storm-water Facilities	Industrial Land	Detached Res Lots	Fish Blockages	Eroded Banks	Trash Dumping	Public Land	Parks, Forest, & Wetlands	Unforested Streamside	Development Envelope	Good Stream Health Indicator	Total Points	Total Possible Points	Score
Middle Winters DD	OP-4				1							NA	1	10	10
Bear Cabin	OP-8		1							1		1	2	11	18
Lower Bynum	BC-2	1	1		1	1	1					1	5	11	45
Cranberry Run	CC-3				NA	NA	NA					1	2	8	25
Middle Bynum	BC-3			1	1	1	1			1	1	1	7	11	64
Lower Winters DD	OP-2		1				1					1	2	11	18
Upper Bynum	BC-4	1		1	1	1				1			4	11	36
Plumtree Run	OP-9	1		1	NA			1			1		4	10	40
All subwatersheds have an impervious cover between 10 and 25% NA: data not available 1: For additional information on the point system, see Section 2.7															





# **APPENDIX G**

## **BUSH RIVER STAKEHOLDER MEETING INPUT**



## **BREAK OUT GROUPS:**

### **1. What do you value most about the Bush River Watershed and the place you live?**

- Rural atmosphere
- Quality of life factor
- Green rolling hills
- Natural aspect/wildlife
- Diversity of plants and animals
- Wetlands, forests, meadows,
- Quality of Air
- Benefits of Rural/City Combination
- Breeze
- Natural areas
- Picturesque nature of the area
- Head of the Chesapeake Bay
- Boating
- Scenery
- Waterfowl/hunting
- Recreation opportunities
- Overall livability

### **2. In your opinion, what are the top issues facing the Bush River watershed?**

- Critical area protection
- Streambank erosion
- Agricultural pollution
- Education/watershed awareness
- Erosion and sediment control
- Impervious surfaces
- Growth management
- Lack of enforcement in development community
- Lack of buffers
- Sediment
- Water depth
- Population growth
- Loss of forest
- Type of development (perception of what is desirable)
- Lack of Stewardship
- Stormwater runoff
- State Budget or lack thereof

### **3. Which of the eight tools do you feel restoration and protection efforts should be focused on?**

- Land Conservation
- Stream Buffers
- Better Site Design

## Bush River Watershed Management Plan

---

- Erosion and Sediment Control (ESC)
- Stormwater management
- Stewardship/education

### QUESTIONNAIRE:

# Returned: 16

#### 1. What activities would you as a citizen, be interested in participating:

- |  |  |
|--|--|
| <u>11</u> Tree planting                            | <u>3</u> Hazardous waste drop offs               |
| <u>9</u> Reducing fertilizer use                   | <u>11</u> Stream clean-ups                       |
| <u>7</u> Reducing pesticide use                    | <u>5</u> Adopt-a-pond or stream programs         |
| <u>6</u> Picking up after your pet                 | <u>3</u> Putting land in a conservation easement |
| <u>6</u> Being a member of a local watershed group |  |

#### Other/Additional Comments:

- Streambank Stabilization & WQ/Benthic Monitoring Training
- Encouraging County Gov't to enact legislation that will protect our watershed and promote resource conservation

#### 2. Do you support land conservation, transfer of development rights, and open space acquisition initiatives in high quality subwatersheds?

Yes	No	No Answer/Other
7	0	9*
*I believe there were a high number of "no answers" for this questions b/c people were not sure if they were supposed to answer this question or just skip to 2a.		

#### Other/Additional Comments:

- Transfer of development rights, if managed properly; do we have the money?
- I would support land conservation but not transfer of development rights

#### a. The use of public funds for these policies?

Yes	No	No Answer/Other
10	1	5

#### Other/Additional Comments:

- Only for Acquisitions

## Bush River Watershed Management Plan

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- Promote County regulations for developers to stop sediment, etc
- In good times (strong economy)

### b. Denser development in other areas as a result of these programs?

Yes	No	No Answer/Other
10	2	4

#### Other/Additional Comments:

- Yes, but only if new SW Regs are instituted to reduce impervious surface
- I cannot see destroying one area to protect another. I feel development should be able to support what's going on

### 3. Do you support expenditures of public money on watershed restoration and protection?

Yes	No	No Answer/Other
15	0	1

#### Other/Additional Comments:

- Yes, we need to locate more federal/state monies to assist Counties and local watershed groups in protecting and improving watersheds.
- Within reason
- YES!!!



# **APPENDIX H**

## **A SURVEY OF RESIDENTIAL NUTRIENT BEHAVIOR**





**Background:**

Hello, I am calling on behalf of the Center for Watershed Protection. We are conducting a brief 5 minute survey of local citizens to assess whether certain programs designed to protect the water quality of the Chesapeake Bay are accomplishing their goal. We are also trying to establish which media or outreach techniques are most effective at reaching citizens within the Chesapeake Bay region. Would you be willing to spare a few minutes to help us determine how your tax dollars may be spent more effectively to improve the water quality of your local streams and the Bay?

**Personal Profile Info**

Some question to guard against bias based on who answers the phone. Probably the adult whose birthday falls next. Some questions regarding age, location, possibly income.

**Section I: Lawn Care Maintenance and fertilizer use:**

Question 1: Do you have a lawn or yard? (Yes \_\_\_ or no \_\_\_). If yes, answer the following questions. If no, skip to the next section.

Question 2: Who maintains your lawn and/or yard?  
Homeowner\_\_\_\_\_  
Lawn Care Company\_\_\_\_\_  
Other\_\_\_\_\_

Question 3: If you hire a lawn care company, how did you pick them ? (check all that apply)  
Contacted directly by company (by phone or mail) \_\_\_ Cheapest rates\_\_\_ First in the  
phone book\_\_\_ Recommendation of a friend\_\_\_ Reputation for high quality lawns\_\_\_\_\_  
Being “environmentally friendly”\_\_\_\_\_

**If respondent uses lawn care service, skip to question 12**

Question 4: Have you ever obtained advice or information on how to manage your lawn (e.g., watering, fertilizing, composting, establishing turf)?  
Yes\_\_\_ No\_\_\_ Don't Know\_\_\_

**If respondent answers No or Don't Know, skip to question 7**

Question 5: Did this advice include information or techniques on managing your lawn to better protect the environment? ?  
Yes\_\_\_ No\_\_\_ Don't Know\_\_\_

Question 6: Did you apply this information to make changes to the way you care for your lawn?  
Not at all\_\_\_ some changes\_\_\_ significant changes\_\_\_

Question 7: Do you fertilize your yard? Yes\_\_\_ No\_\_\_ Don't Know\_\_\_

Question 8: How many times a year do you fertilize? \_\_\_ Times \_\_\_ Don't Know\_\_\_

- Question 9: When do you fertilize your yard?  
Fall\_\_\_ Spring\_\_\_ Summer\_\_\_ Winter\_\_\_ Don't fertilize\_\_\_
- Question 10: What information do you use to decide how much fertilizer to apply ? (check all that apply)  
Consult label on the bag \_\_\_  
Use recommendations of a local agency or extension agent \_\_\_  
Fertilize to green up lawn \_\_\_  
Consult garden or lawn care center \_\_\_  
Other (source of information) \_\_\_  
Don't use any information\_\_\_
- Question 11: Have you had a soil nutrient test on your lawn in the last three years?  
Yes\_\_\_ No\_\_\_ Don't Know \_\_\_
- Question 12: Do you compost or recycle your leaves? Yes\_\_\_ No\_\_\_ Don't Know\_\_\_
- Question 13: Have you applied pesticides to your yard or garden in the last year?  
Yes\_\_\_ No\_\_\_ Don't Know\_\_\_
- Question 14: How do you decide how much pesticide to apply? Past experience \_\_\_ Advice from cooperative extension/local agency\_\_\_ Product labels\_\_\_ Friends/Neighbors Lawn Care Company\_\_\_ Garden Center\_\_\_ Apply "just in case"\_\_\_ Don't use \_\_\_

## **Section II: Septic System Questions**

- Question 1: Is your home served by a septic system? Yes \_\_\_or no \_\_\_. If yes, answer the following questions. If no, skip to the pet waste section.
- Question 2: How old is your house? \_\_\_\_\_ Years \_\_\_ Don't Know\_\_\_
- Question 3: Do you know approximately where your septic system is located in your yard?  
Yes\_\_\_ No\_\_\_
- Question 4: Have your had your septic system tank inspected in the last three years?  
Yes\_\_\_ No\_\_\_ Don't Know\_\_\_
- Question 5: Have you had your septic system tank cleaned out in the last five years?  
Yes\_\_\_ No\_\_\_ Don't Know\_\_\_
- Question 7: Do you dispose of any of the following materials down your drains/toilets:  
Grease Yes\_\_\_ No\_\_\_  
Baby wipes Yes\_\_\_ No\_\_\_  
Coffee grounds Yes\_\_\_ No\_\_\_  
Bleach Yes\_\_\_ No\_\_\_  
Cigarette Butts Yes\_\_\_ No\_\_\_  
Facial Tissues Yes\_\_\_ No\_\_\_

- Question 8: Have you ever obtained advice on how to maintain your septic system  
Yes\_\_\_ No\_\_\_ Don't Know\_\_\_
- Question 9: If yes, where do you go for your advice?  
Local health department or other agency \_\_\_ Friends/Neighbors\_\_\_ Cooperative  
extension office \_\_\_ Pumping service \_\_\_ Books/magazine \_\_\_ Internet\_\_\_
- Question 10 Do you agree or disagree with this statement:  
Inspection and routine clean out of septic tanks is necessary to protect the water  
quality of the Bay.  
Agree\_\_\_ Don't know/no opinion\_\_\_ Disagree\_\_\_

### **Section III: Pet Waste Disposal Questions**

- Question 1: Do you own a dog? Yes \_\_\_or no \_\_\_. If yes, answer the following questions. If  
no, skip to the attitudes section.
- Question 2: Do you walk your dog? Yes\_\_\_ No\_\_\_
- Question 3: How frequently do you clean up after your dog on walks?  
Not at all\_\_\_ Occasionally \_\_\_ Most of the time \_\_\_All the time\_\_\_
- Question 4: For those people which do not answer all the time on Question 3  
Which of the following factors would encourage you to clean up after your dog?  
Convenient disposal locations at parks or along trails\_\_\_  
A fine\_\_\_  
A simple, sanitary collection method (aka, Pooper-scooper, etc)\_\_\_  
Complaints of neighbors\_\_\_
- Question 5 Do you agree or disagree with the following statement:  
Pet waste can be a source of nutrients and bacteria for nearby streams and water  
bodies.  
Agree\_\_\_ Don't know/no opinion\_\_\_ Disagree\_\_\_

### **Section IV: Outreach Questions**

Which of the following sources of information do you feel are most effective at attracting your  
attention about protecting water quality. Please rate on a scale of 1-10, with 1 being the least  
effective and 10 being the most effective:

- \_\_\_\_\_Brochures mailed to my home
- \_\_\_\_\_Supplement in your local newspaper
- \_\_\_\_\_Community newsletter article
- \_\_\_\_\_Free educational video
- \_\_\_\_\_ Demonstration project in your neighborhood
-

- \_\_\_\_\_ Free home consultation from local expert
- \_\_\_\_\_ Public service announcements on television
- \_\_\_\_\_ Internet website
- \_\_\_\_\_ Weekend training workshop
- \_\_\_\_\_ Public access cable shows
- \_\_\_\_\_ Radio call in show
- \_\_\_\_\_ Public television shows on topics such as gardening or home repair/maintenance
- \_\_\_\_\_ Regular newspaper column
- \_\_\_\_\_ Phone consultation with extension agent

# **APPENDIX I**

## **TOP TEN THINGS YOU CAN DO TO PROTECT YOUR WATERSHED**



**Top Ten Things You Can Do to Protect Your Watershed**

1. Water Only Where & When It's Really Needed 
2. Limit Use of Pesticides & Fertilizers 
3. Plant Native Vegetation 

Center for Watershed Protection

**Top 10 Things You Can Do to Protect Your Watershed**

4. Redirect Rooftop Runoff 
5. Dispose of Pet Waste Properly 
6. Carefully Choose Where to Wash Your Car 

Center for Watershed Protection

**Top 10 Things You Can Do to Protect Your Watershed**

7. Properly Maintain Vehicles 
8. Recycle and Dispose of Household Chemicals Properly 
9. Properly Maintain Septic System 

Center for Watershed Protection

And the best thing you can do for your watershed is...

**10. Join a Watershed Organization!**



Learn more about your watershed and its unique qualities!



Find out what the land development plans are for your area!



Be involved in the future of your environment!

Center for Watershed Protection

The top ten things you can do to protect your watershed are:

- 1) Water your lawn only where and when needed.
- 2) Limit the use of pesticides and fertilizers used on your lawn. Consider using an alternative to the use of chemical pesticides, such as Integrated Pest Management (IPM), which is the use of natural methods to deter pests.
- 3) Plant native vegetation. By planting vegetation that is adapted to your region you will reduce the amount of pesticides, fertilizers and watering that will be required. This means less work for you!
- 4) Redirect rooftop runoff using a rain barrel or at the very least a spreader.
- 5) Dispose of pet waste properly. Because pet waste can be high in bacteria and nutrients, it should be disposed of in a toilet or trash can.
- 6) Carefully choose where you wash your car. Washing your car on you lawn will reduce the amount of water that is converted to runoff and allow the detergents to be filtered by your lawn before it enters the stream system. Another alternative is choosing an automatic carwash that is connected to the sewer system or recycles wash water.
- 7) Properly maintain your car. Regular maintenance will ensure a smooth running machine and reduce the amount of oil and other fluid leaks as well as reducing other pollutants that result from driving cars.
- 8) Dispose of or recycle chemicals properly. All paints, oils, grease, antifreeze and cleaning products should be disposed of properly. Many of these items need to special processing which dumping down the stormdrain or even a household drain can not do. Many communities have a household hazardous waste disposal station or annual collection day.
- 9) Properly maintain septic system. For most people, out of site out of mind. Unfortunately though, septic systems are one of the top polluters because of their limited lifetime and up to 35% failure rate. Septic system discharge has high levels of bacteria and nutrients that can contaminate the groundwater, as well as streams. It is critical to have your septic system regularly inspected and maintained. Inspections should be done at least once every three years.
- 10) The best thing you can do to protect your watershed is to join a watershed organization. Doing so will help you learn more about your own watershed and its unique qualities. It will keep you informed as to what is going on in your watershed and what future plans there are for development. Watershed organizations can also provide a unified plan of action that can really make a difference in the future of your watershed.





# **APPENDIX J**

## **HARFORD COUNTY CODES AND ORDINANCES WORKSHEET**



# HARFORD COUNTY

## CHAPTER 3

# CODE AND ORDINANCE WORKSHEET

The Code and Ordinance Worksheet allows an in-depth review of the standards, ordinances, and codes (i.e., the development rules) that shape how development occurs in your community. You are guided through a systematic comparison of your local development rules against the model development principles. Institutional frameworks, regulatory structures and incentive programs are included in this review. The worksheet consists of a series of questions that correspond to each of the model development principles. Points are assigned based on how well the current development rules agree with the site planning benchmarks derived from the model development principles.

The worksheet is intended to guide you through the first two steps of a local site planning roundtable.

Step 1: Find out what the Development Rules are in your community.

Step 2: See how your rules stack up to the Model Development Principles.

The homework done in these first two steps helps to identify which development rules are potential candidates for change.

## PREPARING TO COMPLETE THE CODE AND ORDINANCE WORKSHEET

Two tasks need to be performed before you begin in the worksheet. First, you must identify all the development rules that apply in your community. Second, you must identify the local, state, and federal authorities that actually administer or enforce the development rules within your community. Both tasks require a large investment of time. The development process is usually shaped by a complex labyrinth of regulations, criteria, and authorities. A team approach may be helpful. You may wish to enlist the help of a local plan reviewer, land planner, land use attorney, or civil engineer. Their real-world experience with the development process is often very useful in completing the worksheet.

### Identify the Development Rules

Gather the key documents that contain the development rules in your community. A list of potential documents to look for is provided in Table 4. Keep in mind that the information you may want on a particular development rule is not always found in code or regulation, and may be hidden in supporting design manuals, review checklists, guidance document or construction specifications. In most cases, this will require an extensive search. Few communities include all of their

**Table 4: Key Local Documents that will be Needed to Complete the COW**

Zoning Ordinance
Subdivision Codes
Street Standards or Road Design Manual
Parking Requirements
Building and Fire Regulations/Standards
Stormwater Management or Drainage Criteria
Buffer or Floodplain Regulations
Environmental Regulations
Tree Protection or Landscaping Ordinance
Erosion and Sediment Control Ordinances
Public Fire Defense Masterplans
Grading Ordinance

rules in a single document. Be prepared to contact state and federal, as well as local agencies to obtain copies of the needed documents.

### **Identify Development Authorities**

Once the development rules are located, it is relatively easy to determine which local agencies or authorities are actually responsible for administering and enforcing the rules. Completing this step will provide you with a better understanding of the intricacies of the development review process and helps identify key members of a future local roundtable.

Table 5 provides a simple framework for identifying the agencies that influence development in your community. As you will see, space is provided not only for local agencies, but for state and federal agencies as well. In some cases, state and federal agencies may also exercise some authority over the local development process (e.g., wetlands, some road design, and stormwater).

## **USING THE WORKSHEET: HOW DO YOUR RULES STACK UP TO THE MODEL DEVELOPMENT PRINCIPLES?**

### **Completing the Worksheet**

Once you have located the documents that outline your development rules and identified the authorities responsible for development in your community, you are ready for the next step. You can now use the worksheet to compare your development rules to the model development principles.

The worksheet is presented at the end of this chapter. The worksheet presents seventy-seven site planning benchmarks. The benchmarks are posed as questions. Each benchmark focuses on a specific site design practice, such as the minimum diameter of cul-de-sacs, the minimum width of streets, or the minimum parking ratio for a certain land use. You should refer to the codes, ordinances, and plans identified in the first step to determine the appropriate development rule.

The questions require either a yes or no response or a specific numeric criteria. If your development rule agrees with the site planning benchmark, you are awarded points.

### **Calculating Your Score**

A place is provided on each page of the worksheet to keep track of your running score. In addition, the worksheet is subdivided into three categories:

- Residential Streets and Parking Lots (Principles No. 1 - 10)
- Lot Development (Principles No. 11 - 16)
- Conservation of Natural Areas (Principles No. 17 - 22).

For each category, you are asked to subtotal your score. This **"Time to Assess"** allows you to consider which development rules are most in line with the site planning benchmarks and what rules are potential candidates for change.

The total number of points possible for all of the site planning benchmarks is 100. Your overall score provides a general indication of your community's ability to support environmentally sensitive development. As a general rule, if your overall score is lower than 80, then it may be advisable to systematically reform your local development rules. A score sheet is provided at end of the Code and Ordinance Worksheet to assist you in determining where your community's score places in respect to the Model Development Principles.

Once you have completed the worksheet, go back and review your responses. Determine if there are specific areas that need improvement (e.g., development rules that govern road design) or if your development rules are generally pretty good. This review is key to implementation of better development: assessment of your current development rules and identification of impediments to innovative site design. This review also directly leads into the next step: a site planning roundtable process conducted at the local government level. The primary tasks of a local roundtable are to systematically review existing development rules and then determine if changes can or should be made. By providing a much-needed framework for overcoming barriers to better development, the site planning roundtable can serve as an important tool for local change.

**Table 5: Local, State, and Federal Authorities Responsible for Development in Your Community**

Development Responsibility	State/Federal	County	Town
Sets road standards	Agency: _____ Contact Name: _____ Phone No.: _____	_____	_____
Review/approves subdivision plans	Agency: _____ Contact Name: _____ Phone No.: _____	_____	_____
Establishes zoning ordinances	Agency: _____ Contact Name: _____ Phone No.: _____	_____	_____
Establishes subdivision ordinances	Agency: _____ Contact Name: _____ Phone No.: _____	_____	_____

**Table 5: Local, State, and Federal Authorities Responsible for Development in Your Community  
(Continued)**

Development Responsibility	State/Federal	County	Town
Reviews/establishes stormwater management or drainage criteria	Agency: _____ Contact Name: _____ Phone No.: _____	_____	_____
Provides fire protection and fire protection code enforcement	Agency: _____ Contact Name: _____ Phone No.: _____	_____	_____
Oversees buffer ordinance	Agency: _____ Contact Name: _____ Phone No.: _____	_____	_____
Oversees wetland protection	Agency: _____ Contact Name: _____ Phone No.: _____	_____	_____
Establishes grading requirements or oversees erosion and sediment control program	Agency: _____ Contact Name: _____ Phone No.: _____	_____	_____
Reviews/approves septic systems	Agency: _____ Contact Name: _____ Phone No.: _____	_____	_____
Reviews/approves utility plans (e.g., water and sewer)	Agency: _____ Contact Name: _____ Phone No.: _____	_____	_____
Reviews/approves forest conservation/ tree protection plans?	Agency: _____ Contact Name: _____ Phone No.: _____	_____	_____

## 1. Street Width

What is the minimum pavement width allowed for streets in low density residential developments that have less than 500 average daily trips (ADT)?

If your answer is between **18-22 feet**, give yourself 4 points ☐

"20' OPEN SECTION OR 24' CLOSED SECTION"

20'

feet

R-10

4

YES/NO

At higher densities are parking lanes allowed to also serve as traffic lanes (i.e., queuing streets)?

If your answer is **YES**, give yourself 3 points ☐

NO DISTINCTION  
FOUND BY

"CHRYL BERNIGAN"

YES  
3 pts

## 2. Street Length

Do street standards promote the most efficient street layouts that reduce overall street length?

If your answer is **YES**, give yourself 1 point ☐

THERE WAS NO MENTION  
ABOUT MINIMIZING

VERY SUBJECTIVE

pg R-6

YES / NO

NO  
0

## 3. Right-of-Way Width

What is the minimum right of way (ROW) width for a residential street?

If your answer is **less than 45 feet**, give yourself 3 points ☐

50' feet

R-10

YES / NO

Does the code allow utilities to be placed under the paved section of the ROW?

If your answer is **YES**, give yourself 1 point ☐

DPW / SUBJECT  
TO APPROVAL

pg R-37

W/S  
P 25-9

## 4. Cul-de-Sacs

What is the minimum radius allowed for cul-de-sacs? Depends on School Bus

If your answer is **less than 35 feet**, give yourself 3 points ☐

If your answer is **36 feet to 45 feet**, give yourself 1 point ☐

Request by HANFORD CO BOARD OF ED.?

function

40 / 55' feet

R-16

SEE ROW D

(YES) / NO

Can a landscaped island be created within the cul-de-sac?

If your answer is **YES**, give yourself 1 point ☐

ONLY UPON APPROVAL

1

R-16

R-36

Are alternative turn arounds such as "hammerheads" allowed on short streets in low density residential developments?

If your answer is **YES**, give yourself 1 point ☐

TEMP ONLY

BUT WHAT ABOUT  
OTHER ALTERNATIVES?

MONUMENTAL  
ENTRANCES / LOOP DE LANES

YES / (NO)

0

R-17

10

R-22



Development Feature

Your Local Criteria

5. Vegetated Open Channels

Are curb and gutters required for most residential street sections?

If your answer is **NO**, give yourself 2 points ☐

ON LOW DENSITY 2500 ADT  
OPEN SECTION ALLOWED

ANYWHERE ELSE  
ITS REQUIRED

YES / NO

R-10

0

Are there established design criteria for swales that can provide stormwater quality treatment (i.e., dry swales, biofilters, or grass swales)?

If your answer is **YES**, give yourself 2 points ☐

YES / NO

YES  
2  
BRIER

6. Parking Ratios

What is the minimum parking ratio for a professional office building (per 1000 ft<sup>2</sup> of gross floor area)?

If your answer is **less than 3.0 spaces**, give yourself 1 point ☐

1 per 300 ft<sup>2</sup> spaces

0

§ 267  
pg 66

What is the minimum required parking ratio for shopping centers (per 1,000 ft<sup>2</sup> gross floor area)?

If your answer is **4.5 spaces or less**, give yourself 1 point ☐

1 per 250 ft<sup>2</sup> = 4

> 300,000

then 4.5 per 1000 ft<sup>2</sup>

1

2 spaces

pg 66

What is the minimum required parking ratio for single family homes (per home)?

If your answer is **less than or equal to 2.0 spaces**, give yourself 1 point ☐

1

pg 67

Are your parking requirements set as maximum or median (rather than minimum) requirements?

If your answer is **YES**, give yourself 2 points ☐

YES / NO

minimum

0

pg 63

7. Parking Codes

Is the use of shared parking arrangements promoted?

If your answer is **YES**, give yourself 1 point ☐

NON-RESIDENTIAL USES  
ONLY

YES / NO

1

pg 6

code does not  
disallow it, no  
incentives

"ALLOWED"  
INCENTIVES?

YES / NO

Are model shared parking agreements provided?

If your answer is **YES**, give yourself 1 point ☐

UPON REQUEST

1

pg 6

YES / NO

Are parking ratios reduced if shared parking arrangements are in place?

6

If your answer is **YES**, give yourself 1 point ☐

If mass transit is provided nearby, is the parking ratio reduced?

If your answer is **YES**, give yourself 1 point ☐

8. Parking Lots

What is the minimum stall width for a standard parking space?

If your answer is **9 feet or less**, give yourself 1 point ☐

What is the minimum stall length for a standard parking space?

If your answer is **18 feet or less**, give yourself 1 point ☐

Are at least 30% of the spaces at larger commercial parking lots required to have smaller dimensions for compact cars?

If your answer is **YES**, give yourself 1 point ☐

Can pervious materials be used for spillover parking areas?

If your answer is **YES**, give yourself 2 points ☐

9. Structured Parking

Are there any incentives to developers to provide parking within garages rather than surface parking lots?

If your answer is **YES**, give yourself 1 point ☐

10. Parking Lot Runoff

Is a minimum percentage of a parking lot required to be landscaped?

If your answer is **YES**, give yourself 2 points ☐

Is the use of bioretention islands and other stormwater practices within landscaped areas or setbacks allowed?

If your answer is **YES**, give yourself 2 points ☐

CRD  
shared parking P. 220-E

NO

YES / NO

Pg 64

NO

0

only place

is CRD pg 220

but this is where most mass transit is allowed

9 feet

9 x 18

18 feet

Pg 63

YES / NO

NO

YES / NO / UNCLEAR

0

YES / NO

NO / 0

Pg 22

"possible 20% reduction hinted"

YES / NO

5%

"crappy"

YES / NO

YES

2

Bruce

0



**Time to Assess:** Principles 1 - 10 focused on the codes, ordinances, and standards that determine the size, shape, and construction of parking lots, roadways, and driveways in the suburban landscape. There were a total of **40** points available for Principles 1 - 10. What was your total score?

Subtotal Page 15 \_\_\_\_\_ + Subtotal Page 16 \_\_\_\_\_ + Subtotal Page 17 \_\_\_\_\_ =

**22**

Where were your codes and ordinances most in line with the principles? What codes and ordinances are potential impediments to better development?

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### 11. Open Space Design

Are open space or cluster development designs allowed in the community?

If your answer is **YES**, give yourself **3** points ☐

If your answer is **NO**, skip to question No. 12

**YES** / NO

**3**

pg 13  
227-2

Is land conservation or impervious cover reduction a major goal or objective of the open space design ordinance?

If your answer is **YES**, give yourself **1** point ☐

**YES** / NO

**1**

pg  
221

Are the submittal or review requirements for open space design greater than those for conventional development?

If your answer is **NO**, give yourself **1** point ☐

**YES** / NO

**0**

pg 13:  
138

Is open space or cluster design a by-right form of development?

If your answer is **YES**, give yourself **1** point ☐

Yes if you meet minimum criteria

**YES** / NO

**1**

Are flexible site design criteria available for developers that utilize open space or cluster design options (e.g., setbacks, road widths, lot sizes)?

If your answer is **YES**, give yourself **2** points ☐

**YES** / NO

**2**

pg 238

Community Codes and Ordinances Worksheet

Subtotal Page 18

**7**

NOT FOR  
FDD

pg 1  
pg.

Is very vague - 18 -  
from perspective of reviewer

12. Setbacks and Frontages

Are irregular lot shapes (e.g., pie-shaped, flag lots) allowed in the community?

If your answer is **YES**, give yourself 1 point ☐

YES / NO

PS 52

What is the minimum requirement for front setbacks for a **one half (1/2) acre** residential lot?

If your answer is **20 feet or less**, give yourself 1 point ☐

$$\begin{array}{r} R-1 \\ 20,000 - 40' \\ \hline 15,000 - 35' \end{array}$$

\_\_\_\_\_ feet

PS 144

What is the minimum requirement for rear setbacks for a **one half (1/2) acre** residential lot?

If your answer is **25 feet or less**, give yourself 1 point ☐

$$\begin{array}{r} 50' \\ \hline 40' \end{array}$$

\_\_\_\_\_ feet

PS 144

What is the minimum requirement for side setbacks for a **one half (1/2) acre** residential lot?

If your answer is **8 feet or less**, give yourself 1 points ☐

$$\begin{array}{r} 15' \\ \hline 10' \end{array}$$

\_\_\_\_\_ feet

PS 144

What is the minimum frontage distance for a **one half (1/2) acre** residential lot?

If your answer is **less than 80 feet**, give yourself 2 points ☐

$$\begin{array}{r} 100' \\ \hline 80' \end{array}$$

\_\_\_\_\_ feet

PS 144

13. Sidewalks

What is the minimum sidewalk width allowed in the community?

If your answer is **4 feet or less**, give yourself 2 points ☐

4' feet

R-35

Are sidewalks always required on both sides of residential streets?

If your answer is **NO**, give yourself 2 points ☐ IF AV. LOT WIDTHS < 100ft

PRETTY MUCH, EXCEPT UNDER WAIVER

YES / NO

SUB REQ 4.2.4 PG 2

YES / NO

> R-3

Are sidewalks generally sloped so they drain to the front yard rather than the street?

If your answer is **YES**, give yourself 1 point ☐

YES / NO

S-9

Can alternate pedestrian networks be substituted for sidewalks (e.g., trails through common areas)?

If your answer is **YES**, give yourself 1 point ☐

R-36

bikeway/shared sidewalk on 1 side

## 14. Driveways

What is the minimum driveway width specified in the community?

NO STANDARDS

If your answer is 9 feet or less (one lane) or 18 feet (two lanes), give yourself 2 points

☐

10-24'

Can pervious materials be used for single family home driveways (e.g., grass, gravel, porous pavers, etc)?

If your answer is YES, give yourself 2 points ☐

Can a "two track" design be used at single family driveways?

If your answer is YES, give yourself 1 point ☐

Are shared driveways permitted in residential developments?

If your answer is YES, give yourself 1 point ☐ "panshandle"

## 15. Open Space Management

Skip to question 16 if open space, cluster, or conservation developments are not allowed in your community.

Does the community have enforceable requirements to establish associations that can effectively manage open space?

If your answer is YES, give yourself 2 points ☐

Are open space areas required to be consolidated into larger units?

If your answer is YES, give yourself 1 point ☐

Does a minimum percentage of open space have to be managed in a natural condition?

If your answer is YES, give yourself 1 point ☐

Are allowable and unallowable uses for open space in residential developments defined?

If your answer is YES, give yourself 1 point ☐

Can open space be managed by a third party using land trusts or conservation easements?

If your answer is YES, give yourself 1 point ☐

*As long as state says so*

16. Rooftop Runoff

Can rooftop runoff be discharged to yard areas?

If your answer is YES, give yourself 2 points ☐

YES / NO

2

Do current grading or drainage requirements allow for temporary ponding of stormwater on front yards or rooftops?

If your answer is YES, give yourself 2 points ☐

YES / NO

0

*Bruce said "no"*

*But new bio-retention areas*



**Time to Assess:** Principles 11 through 16 focused on the regulations which determine lot size, lot shape, housing density, and the overall design and appearance of our neighborhoods. There were a total of **36** points available for Principles 11 - 16. What was your total score?

Subtotal Page 18 \_\_\_\_\_ + Subtotal Page 19 \_\_\_\_\_ + Subtotal Page 20 \_\_\_\_\_ =

18

Where were your codes and ordinances most in line with the principles? What codes and ordinances are potential impediments to better development?

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*DEERCREEK ?*

17. Buffer Systems ?

Is there a stream buffer ordinance in the community?

If your answer is YES, give yourself 2 points ☐

*Natural Resources District  
Ches P. Bay Critical Areas  
(?)  
100-yr floodplain*

YES / NO

2

If so, what is the minimum buffer width?

If your answer is 75 feet or more, give yourself 1 point ☐

*150' ft / 75' on frills  
50' ft "other" streams*

Is expansion of the buffer to include freshwater wetlands, steep slopes or the 100-year floodplain required?

If your answer is YES, give yourself 1 point ☐

YES / NO

1

4

*"NRD bump-up" 182*

## 18. Buffer Maintenance

If you do not have stream buffer requirements in your community, skip to question No. 19

Does the stream buffer ordinance specify that at least part of the stream buffer be maintained with native vegetation?

If your answer is YES, give yourself 2 points ☐

Does the stream buffer ordinance outline allowable uses?

If your answer is YES, give yourself 1 point ☐

Does the ordinance specify enforcement and education mechanisms?

If your answer is YES, give yourself 1 point ☐

YES / NO

0

YES / NO

1

YES / NO

0

## 19. Clearing and Grading

Is there any ordinance that requires or encourages the preservation of natural vegetation at residential development sites?

If your answer is YES, give yourself 2 points ☐

But if not "first retention area"

Do reserve septic field areas need to be cleared of trees at the time of development?

If your answer is NO, give yourself 1 point ☐

YES / NO

2

YES / NO

1

## 20. Tree Conservation

If forests or specimen trees are present at residential development sites, does some of the stand have to be preserved?

If your answer is YES, give yourself 2 points ☐

Are the limits of disturbance shown on construction plans adequate for preventing clearing of natural vegetative cover during construction?

If your answer is YES, give yourself 1 point ☐

YES / NO

2

YES / NO

1

## 21. Land Conservation Incentives

Are there any incentives to developers or landowners to conserve non-regulated land (open space design, density bonuses, stormwater credits or lower property tax rates)?

If your answer is YES, give yourself 2 points ☐

YES / NO

2

Is flexibility to meet regulatory or conservation restrictions (density compensation, buffer averaging, transferable development rights, off-site mitigation) offered to developers?

YES / NO

If your answer is **YES**, give yourself 2 points ☐

*bump-up  
possible but parcel  
has to be  
contiguous*

2

## 22. Stormwater Outfalls

Is stormwater required to be treated for quality before it is discharged?

*→ sometimes for critical areas  
→ for conservation*

YES / NO

If your answer is **YES**, give yourself 2 points ☐

2

Are there effective design criteria for stormwater best management practices (BMPs)?

YES / NO

If your answer is **YES**, give yourself 1 point ☐

2

Can stormwater be directly discharged into a jurisdictional wetland without pretreatment?

YES / NO

If your answer is **NO**, give yourself 1 point ☐

1

Does a floodplain management ordinance that restricts or prohibits development within the 100 year floodplain exist?

YES / NO

If your answer is **YES**, give yourself 2 points ☐

1

☐ **Time to Assess:** Principles 17 through 22 addressed the codes and ordinances that promote (or impede) protection of existing natural areas and incorporation of open spaces into new development. There were a total of **24** points available for Principles 17 - 22. What was your total score?

Subtotal Page 21 \_\_\_\_\_ + Subtotal Page 22 \_\_\_\_\_ + Subtotal Page 23 \_\_\_\_\_ =

21

Where were your codes and ordinances most in line with the principles? What codes and ordinances are potential impediments to better development?

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To determine final score, add up subtotal from each ☐ **Time to Assess**



Principles 1 - 10 (Page 18)

Principles 11 - 16 (Page 21)

Principles 17 - 22 (Page 23)

**TOTAL**

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**SCORING** (A total of **100** points are available):

See Page 10 to determine where your community's score places in respect to the site planning roundtable Model Development Principles:

Your Community's Score		
90- 100	<input type="checkbox"/>	Congratulations! Your community is a real leader in protecting streams, lakes, and estuaries. Keep up the good work.
80 - 89	<input type="checkbox"/>	Your local development rules are pretty good, but could use some tweaking in some areas.
79 - 70	<input type="checkbox"/>	Significant opportunities exist to improve your development rules. Consider creating a site planning roundtable.
60 - 69	<input type="checkbox"/>	Development rules are inadequate to protect your local aquatic resources. A site planning roundtable would be very useful.
less than 60	<input type="checkbox"/>	Your development rules definitely are not environmentally friendly. Serious reform of the development rules is needed.